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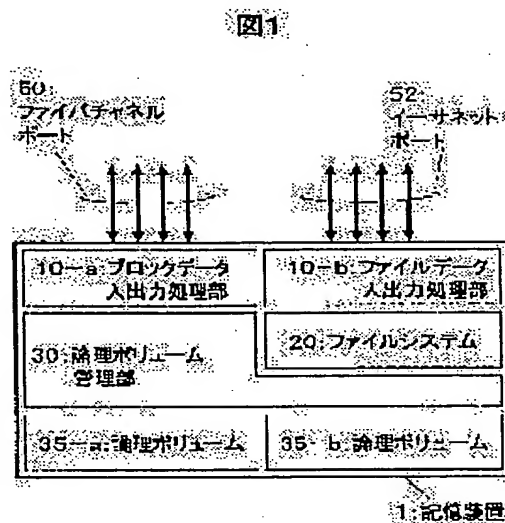
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## (54) STORAGE DEVICE, FILE DATA BACKUP METHOD AND FILE DATA COPYING METHOD

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide a storage device which is easy to manage by effectively utilizing a drive capacity in the coexisting environment of the storage device of block form data and that of file form data.

**SOLUTION:** A block data input/output processing part 10-a converts block data and an address from a fiber channel port 50 to a data format inside of the storage device 1. A file data input/output processing part 10-b converts file data and an address from an Ethernet (registered mark) to the data format of the file system 20. The file system 20 indexes the address of a logical volume 35-b from the address of the system 20 and converts the file data into block data. A logical volume management part 30 indexes the address of a logical volume 35-a for writing the block data from the address outputted by a processing part 10-a, converts this address or the address from the file system 20 to a physical address and writes/reads data to a drive.



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CLAIMS

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[Claim(s)]

[Claim 1] Two or more drives which memorize data. A means to manage the storage region on the aforementioned two or more drives. The port which is the storage equipped with the above, and outputs and inputs block data, The port which outputs and inputs file data, and the radial transfer means of block data, It has the file system which has the function to perform the radial transfer means of file data, and the interconversion of file data and block data. The data outputted and inputted from the port which outputs and inputs the aforementioned block data The writing or read-out to the aforementioned storage region is performed through the radial transfer means of the aforementioned block data, and a means to manage the aforementioned storage region. The data outputted and inputted from the port which outputs and inputs the aforementioned file data are characterized by performing the writing or read-out to the aforementioned storage region through a means to manage the radial transfer means, the aforementioned file system, and the aforementioned storage region of the aforementioned file data.

[Claim 2] It is the storage characterized by consisting of the first storage region which memorizes the data with which the storage region of the aforementioned storage is outputted and inputted as block data in storage according to claim 1, and the second storage region which memorizes the data outputted and inputted as file data.

[Claim 3] Storage characterized by having a means to divide the storage region of the aforementioned storage into the first storage region of the above, and the second storage region of the above, in storage according to claim 2.

[Claim 4] Storage characterized by having a means by which a means to divide the aforementioned storage region assigns a part of first storage region of the above to the second storage region of the above, changes it, and carries out it in storage according to claim 3, and the means which assigns a part of second storage region of the above to the first storage region of the above, changes it, and carries out it.

[Claim 5] It is the storage characterized by consisting of the first storage region which memorizes the data with which the storage region of the aforementioned storage is outputted and inputted as block data in storage according to claim 1, the second storage region which memorizes the data outputted and inputted as file data, and the third storage region belonging to neither the aforementioned first nor the second storage region.

[Claim 6] Storage characterized by having a means to divide the storage region of the aforementioned storage into the first storage region of the above, the second storage region of the above, and the third storage region of the above, in storage according to claim 5.

[Claim 7] Storage characterized by having a means by which a means to divide the aforementioned storage region assigns, changes and makes a part of third storage region of the above the first storage region of the above, or the second storage region of the above in storage according to claim 6 if needed.

[Claim 8] The total of the aforementioned port which the aforementioned storage has in the storage of either a claim 1 or the claim 7 given in a claim is storage characterized by the number of connections which is being fixed and processes I/O of block data in it, and the number of

ports which processes I/O of file data being adjustable.

[Claim 9] Two or more drives which memorize data. A means to manage the storage region on the aforementioned two or more drives. Two or more ports which are the storage equipped with the above, and output and input an Internet Protocol packet, It has the file system which has the function to perform the radial transfer means of block data and file data, and the interconversion of file data and block data. two or more aforementioned ports It is divided into the first port group which outputs and inputs block data, and the second port group which performs I/O of file data. The data outputted and inputted from the port group of the above first The writing or read-out to the aforementioned storage region is performed through the radial transfer means of the aforementioned block data and file data, and a means to manage the aforementioned storage region. The data outputted and inputted from the port group of the above second are characterized by performing the writing or read-out to the aforementioned storage region through a means to manage the radial transfer means, the aforementioned file system, and the aforementioned storage region of the aforementioned block data and file data.

[Claim 10] It is the storage characterized by consisting of the first storage region which memorizes the data with which the storage region of the aforementioned storage is outputted and inputted as block data in storage according to claim 9, and the second storage region which memorizes the data outputted and inputted as file data.

[Claim 11] Two or more drives which memorize data. A means to manage the storage region on the aforementioned two or more drives. Two or more ports which are the storage equipped with the above, and output and input an Internet Protocol packet, It has the file system which has the function to perform the radial transfer means of block data and file data, and the interconversion of file data and block data. The data with which the radial transfer means of the aforementioned block data and file data is outputted and inputted discriminate block data or file data. It has the function processed as block data or file data. Block data performs the writing or read-out to the aforementioned storage region through the radial transfer means of block data and file data, and a means to manage the aforementioned storage region. File data is characterized by performing the writing or read-out to the aforementioned storage region through a means to manage the radial transfer means, the aforementioned file system, and the aforementioned storage region of block data and file data.

[Claim 12] It is the storage characterized by consisting of the first storage region which memorizes the data with which the storage region of the aforementioned storage is outputted and inputted as block data in storage according to claim 11, and the second storage region which memorizes the data outputted and inputted as file data.

[Claim 13] Storage with which a means to manage the aforementioned storage region is characterized by managing the aforementioned storage region as a logical volume in the storage of either a claim 1 or the claim 12 given in a claim.

[Claim 14] It is the backup method of the file data between the storage which memorizes other block data connected with storage according to claim 2 through the port which outputs and inputs the block data of this storage. The port which performs I/O of the means and the radial transfer means of block data of managing the aforementioned storage region of the storage of the claim 2 aforementioned publication, and block data is minded. The backup method of the file data characterized by outputting and inputting the data of the second storage region which memorizes the file data of the storage of the claim 2 aforementioned publication to the storage which memorizes block data besides the above.

[Claim 15] It is the backup method of the file data between the storage which memorizes other block data connected with storage according to claim 10 through the port which outputs and inputs the block data of this storage. The port which outputs and inputs the Internet Protocol packet the radial transfer means of file data and for a means to manage the aforementioned storage region of the storage of the claim 10 aforementioned publication, block data, and block data is minded. The backup method of the file data characterized by outputting and inputting the data of the second storage region which memorizes the file data of the storage of the claim 10 aforementioned publication to the storage which memorizes block data besides the above.

[Claim 16] It is the backup method of the file data between the storage which memorizes other

block data connected with storage according to claim 12 through the port which outputs and inputs the block data of this storage. The port which performs I/O of the radial transfer means of the means, the block data, and the file data which manage the aforementioned storage region of the storage of the claim 12 aforementioned publication, and an Internet Protocol packet is minded. The backup method of the file data characterized by outputting and inputting the data of the second storage region which memorizes the file data of the storage of the claim 12 aforementioned publication to the storage which memorizes block data besides the above.

[Claim 17] The storage (following, the first storage) of the first claim 2 aforementioned publication, and the storage of the second claim 2 aforementioned publication Are the copy method which copies file data in between, and the port which outputs and inputs the aforementioned file data beforehand is minded. (The following, the second storage) To the aforementioned file system of the second storage of the above, from the aforementioned file system of the first storage of the above Notify the portion set as the copy object in the storage region of the above second, and the port which performs a means to manage the aforementioned storage region, the radial transfer means of block data, and I/O of block data is minded after that. The copy method of the file data characterized by copying the portion for a copy of the aforementioned storage region to the second storage of the above from the first storage of the above.

[Claim 18] The storage (following, the first storage) of the first claim 10 aforementioned publication, and the storage of the second claim 10 aforementioned publication Are the copy method which copies file data in between, and the port which outputs and inputs the Internet Protocol packet for the aforementioned file data beforehand is minded. (The following, the second storage) To the aforementioned file system of the second storage of the above, from the aforementioned file system of the first storage of the above A means to notify the portion set as the copy object in the storage region of the above second, and to manage the aforementioned storage region after that, The port which outputs and inputs the radial transfer means of block data and file data and the Internet Protocol packet for block data is minded. The copy method of the file data characterized by copying the portion for a copy of the aforementioned storage region to the second storage of the above from the first storage of the above.

[Claim 19] The storage (following, the first storage) of the first claim 12 aforementioned publication, and the storage of the second claim 12 aforementioned publication Are the copy method which copies file data in between, and the port which outputs and inputs the aforementioned Internet Protocol packet beforehand is minded. (The following, the second storage) To the aforementioned file system of the second storage of the above, from the aforementioned file system of the first storage of the above A means to notify the portion set as the copy object in the storage region of the above second, and to manage the aforementioned storage region after that, The port which performs the radial transfer means of block data and file data and I/O of an Internet Protocol packet is minded. The copy method of the file data characterized by copying the portion for a copy of the aforementioned storage region to the second storage of the above from the first storage of the above.

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[Translation done.]

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## DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the storage which stores data in a drive, the storage which output and input data in block data form in a detail, and the storage which output and input data in file data form more.

[0002]

[Description of the Prior Art] Data practical use is bearing the important role on the corporate strategy by the spread of the cooperation between companies represented with the present information society by the electronic commerce between companies through the Internet, and supply chain management. The storage system in which information is stored in such a background is central existence of IT plat form and \*\*\*\*\*. Moreover, the cost which maintenance of a storage system and management take with the explosive increase in amount of information is also increasing rapidly. For this reason, it makes system-wide employment, maintenance, and management easy, and is in the inclination which cuts down TCO (Total Cost of Ownership) while each company centralizes the server group connected with a storage system and it in a data center, makes data sharing from various servers possible and performs unitary management of data.

[0003] The storage area network (it abbreviates to SAN (Storage Area Network) hereafter) which is a network only for storage which connects between two or more servers and two or more storage with many-to-many using the switch the fiber channel which is the interface which connects between storage with a server as a method of sharing the data stored in the storage group, and for fiber channels from various server groups is known. The storage connected with SAN represented by the disk array outputs [ while the application performed on a server treats data as data of file format ] and inputs data for data as data of block form. Therefore, in case data are outputted and inputted between a server and storage, the file system on a server changes the data of file format into the data of block form, and performs the I/O to storage through SAN.

[0004] On the other hand, recently, network connection type storage (it omits Following NAS (NetworkAttached Storage)) is spreading rapidly as a method of sharing the data stored in storage from various servers. NAS has a file system in storage, between a server and NAS, I/O of data is performed as data of file format, and the data of file format are changed into the data of block form in the file system in NAS, and it memorizes them to a drive. Therefore, NAS is connected to LAN (Local Area Network) which has permeated as a general network which communicates between servers. As mentioned above, SAN and NAS have spread as a means to share data, and as shown in drawing 2, the environment where NAS7 connected with the storage represented within a data center by the disk array equipment 6 connected with SAN2 of FC (fiber channel) base and LAN3 is intermingled is circulated.

[0005] Moreover, although it said above that SAN is the network which used as the base the fiber channel which exchanges the data of block form The Internet Protocol (it omits Following IP (Internet Protocol)) communication currently generally used in communication between the host servers 1 performed through LAN3 is used now. Standardization of the method for

outputting and inputting the data of the block form between a host server and storage is advanced, and it is thought that SAN9 which used Ethernet as the base spreads in the future. In this case, a bird clapper can be considered by the environment where disk array equipment 6 and NAS7 are intermingled with a gestalt as shown in drawing 3. In order that NAS7 connected to LAN3 may exchange a lot of data between the host servers 1, it presses the load of LAN3 and has possibility of enough of checking communication between the important host servers 1. Therefore, when SAN9 of the Ethernet base spreads, NAS7 shown in drawing 3 can consider the gestalt connected to the direction of SAN9 of the Ethernet base.

[0006]

[Problem(s) to be Solved by the Invention] As shown in drawing 2 and drawing 3, although gestalten differ, respectively, the environment where disk array equipment 6 and NAS7 are intermingled in a data center is considered to spread increasingly from now on. Thus, in the environment where a different-species system exists separately, there is a problem that the maintenance control of a system becomes complicated. moreover, disk array equipment 6 and NAS7 --- also in which, since it is data of block form which are memorized to a drive, it is theoretically possible to share the drive for memorizing data. However, since it was a separate system conventionally, there was a problem that it was difficult to share a drive. Moreover, in NAS, there was a problem that backup and the copy of data were slow, compared with storage, such as disk array equipment which exchanges the data of block form directly without minding a file system, since a file system is minded for data with other storage. Possible [ a deployment of drive capacity ], management of a system offers easy storage and the purpose of this invention has it in cutting down TCO of storage. More specifically, in the mixture environment of the block formal data storage equipment represented by disk array equipment and the file-format data storage equipment represented by NAS, a deployment of drive capacity is possible for the purpose of this invention, and it is to offer the storage which can accelerate backup and the copy of offering the storage with which management was simplified, and file-format data.

[0007]

[Means for Solving the Problem] In the storage which has a means to manage two or more drives which memorize data, and the storage region on the aforementioned two or more drives in this invention in order to attain the above-mentioned purpose The port which outputs and inputs block data, the port which performs I/O of file data, The radial transfer means of block data, the radial transfer means of file data, And the data outputted and inputted from the port which is equipped with the file system which has the function to perform the interconversion of file data and block data, and outputs and inputs the aforementioned block data The writing or read-out to the aforementioned storage region is performed through the radial transfer means of the aforementioned block data, and a means to manage the aforementioned storage region. The data outputted and inputted from the port which outputs and inputs the aforementioned file data are made to perform the writing or read-out to the aforementioned storage region through a means to manage the radial transfer means, the aforementioned file system, and the aforementioned storage region of the aforementioned file data. Moreover, the first storage region which memorizes the data with which the storage region of the aforementioned storage is outputted and inputted as block data, it consists of the second storage region which memorizes the data and inputted as file data. It has a means to divide the storage region of the aforementioned storage into the first storage region of the above, and the second storage region of the above. It is made to have a means by which a means to divide the aforementioned storage region assigns a part of first storage region of the above to the second storage region of the above, changes it, and carries out it, and the means which assigns a part of second storage region of the above to the first storage region of the above, changes it, and carries out it. Moreover, the first storage region which memorizes the data with which the storage region of the aforementioned storage is outputted and inputted as block data, The second storage region which memorizes the data outputted and inputted as file data, And it consists of the third storage region belonging to neither the aforementioned first nor the second storage region. The storage region of the aforementioned storage The first storage region of the above, the second storage region of the above, And it has a means to divide into the third storage region of the

above, and is made to have a means by which a means to divide the aforementioned storage region assigned, changed and makes a part of third storage region of the above the first storage region of the above, or the second storage region of the above if needed. Moreover, it is fixed and the total of the aforementioned port which the aforementioned storage has is made to make adjustable the number of connections which processes I/O of block data in it, and the number of ports which processes I/O of file data. Moreover, it sets to the storage which has a means to manage two or more drives which memorize data, and the storage region on the aforementioned two or more drives. The radial transfer means of two or more ports which output and input an Internet Protocol packet, block data, and file data. It has the file system which has the function to perform the interconversion of file data and block data, and two or more aforementioned ports It is divided into the first port group which outputs and inputs block data, and the second port group which performs I/O of file data. The data outputted and inputted from the port group of the above first The writing or read-out to the aforementioned storage region is performed through the radial transfer means of the aforementioned block data and file data, and a means to manage the aforementioned storage region. The data outputted and inputted from the port group of the above second are made to perform the writing or read-out to the aforementioned storage region through a means to manage the radial transfer means, the aforementioned file system, and the aforementioned storage region of the aforementioned block data and file data. Moreover, it sets to the storage which has a means to manage two or more drives which memorize data, and the storage region on the aforementioned two or more drives. The radial transfer means of two or more ports which output and input an Internet Protocol packet, block data, and file data. And it has the file system which has the function to perform the interconversion of file data and block data. The data with which the radial transfer means of the aforementioned block data and file data is outputted and inputted discriminate block data or file data. It has the function processed as block data or file data. Block data performs the writing or read-out to the aforementioned storage region through the radial transfer means of block data and file data, and a means to manage the aforementioned storage region. The file data is made to perform the writing or read-out to the aforementioned storage region through a means to manage the radial transfer means, the aforementioned file system, and the aforementioned storage region of block data and file data.

[0008]

[Embodiments of the Invention] Hereafter, the example of this invention is explained using a drawing.

<<example 1>> One example of this invention is shown in drawing 1, drawing 4, and drawing 7. This example describes the case where the unit which manages the storage region of storage is a logical volume. About other cases, the same effect is acquired by applying the view of this example. Drawing 1 shows the logical organization of storage 1. Storage 1 consists of the Ethernet port 52 of four fiber channel ports [ 50 or 4 ], block data radial transfer section 10-a, file data radial transfer section 10-b, the logical volume Management Department 30, a file system 20, logical volume 35-a, and b. Logical volume 35-a and b are formed on the physical address of two or more drives of the logical volume Management Department 30, the logical volume Management Department 30 manages the storage region on these two or more drives, and the table (it abbreviates to an address translation table hereafter) which matches the address of a logical volume and the physical address on a drive in the logical volume Management Department 30 is held (not shown). A logical volume is divided into logical volume 35-a for data (it abbreviates to block data hereafter) storage of block form, and logical volume 35-b for data (it abbreviates to file data hereafter) storage of file format. Here, if the fiber channel port 50 is a port which can output and input block data, such as for example, not only this but a SCSI port, it is satisfactory. Moreover, if an Ethernet port is a port which can output and input not only this but file data, it is satisfactory.

[0009] One of the main examples of mounting composition of the logical organization of drawing 1 is shown in drawing 7. Storage 1 consists of four RAID modules 42 which have one fiber channel port 50, respectively, one file server 40 which has four Ethernet ports 52, and two or more drives 44. A file server 40 and four RAID modules 42 are connected by four fiber channels

4. Here, it does not pass over the above-mentioned number in the one example, and there is what limits the number above. [ no ] If the correspondence relation between the logical organization of drawing 1 and the mounting composition of drawing 7 is explained, the block data radial transfer section (10-a) in drawing 1 and logical volume Management Department (30) correspond to the RAID module (42) in drawing 7 mostly. The file data radial transfer section (10-b) and the file system (20) in drawing 1 correspond to the file server (40) in drawing 7 mostly, and the output of a file server (40) is connected to a RAID module (42) by the fiber channel. The logical volume (35-a, 35-b) corresponds to the drive (44).

[0010] Here, although the total of the port which storage 1 has is fixed to eight from a limit of the physical size of storage, the number of the fiber channel ports 50 can be increased by increasing the number of the RAID modules 42. In this case, the number of the Ethernet ports 52 where only the increment of a fiber channel port is connected with a file server is reduced. The number of the fiber channel ports 50 can be increased also by increasing the number of the fiber channel ports 50 connected with one RAID module 42. On the contrary, when increasing the number of the Ethernet ports 52 connected with a file server 40, the number of the fiber channel ports 50 where only the increment is connected with the RAID module 42 is reduced. By carrying out like this, it becomes possible to set up the number of the fiber channel ports 50, and the number of the Ethernet ports 52 according to a demand of a user.

[0011] As shown in drawing 11, the RAID module 42 consists of the input/output controller 150 connected with the fiber channel shown in the fiber channel port 50 and drawing 12 by the fiber channel 4 from a file server, the drive controller 160 which leads to drive 44 by the fiber channel 4, the logical volume controller 170, and a data buffer 165. Radial transfer of block data is performed in an input/output controller 150. Moreover, by the drive controller 160, the writing and read-out processing of the block data to a drive are performed. Moreover, in a data buffer 165, the data between an input/output controller 150 and the drive controller 160 are buffered. Moreover, by the logical volume controller 170, a logical volume composition table is held and matching of the block data and the logical volume which are demanded on the table is performed. Moreover, conversion of the logical address of block data and a physical address is performed.

[0012] As shown in drawing 12, a file server 40 consists of a data buffer 166 with the input/output controller 151 connected with the Ethernet port 52 with Ethernet 5, the input/output controller 152 connected with the RAID module 42 by the fiber channel 4, and a processor 180. Radial transfer of file data is performed in an input/output controller 151. Moreover, in an input/output controller 152, the writing and read-out processing of the block data to the RAID module 42 are performed. Moreover, in a data buffer 166, the data between an input/output controller 151 and an input/output controller 152 are buffered. Moreover, in the processor 180, UNIX (registered trademark) is operating as an OS and NFS (Network File System) is operating as the file system. Processing which changes into the address of block data the file data by which this file system is accessed from a host server is performed. Here, OS does not restrict a file system to NFS in addition to UNIX, either. If it has the function which File IO (input/output request of file-format data) is received from a host server, and it is changed into Block IO (input/output request of block format data), and is accessed to the RAID module 42, there is no problem.

[0013] Allocation of logical volume 35-a for block data and logical volume 35-b for file data is performed by setting up the logical volume composition table in the storage 1 in which allocation of each logical volume is shown from the service processor (it abbreviating to SVP (Service Processor) hereafter) which sets up / manages configuration information in storage 1. As a service processor, the notebook computer connected with storage 1 by LAN can be used, for example. A service processor accesses the logical volume controller 170 shown in drawing 11. At the time of initial setting of storage 1, remaining numbers of logical volumes are assigned to block data for a required number of logical volumes for file data among the total logical volumes. After working storage 1, for example, when the opening of logical volume 35-a for block data is lost and an intact logical volume is in logical volume 35-b for file data, a required number of logical volumes are assigned and changed to logical volume 35-a for block data among intact logical volume 35-b for file data by rewriting a logical volume composition table from a service



processor. Although it is natural, when [ this ] reverse, allocation of a logical volume is changed by rewriting a logical volume composition table.

[0014] Hereafter, the writing of block data and file data and operation of each part at the time of read-out are shown. When writing in block data, block data is inputted from the fiber channel port 50. Next, by block data radial transfer section 10-a, protocol processing of a fiber channel is performed and it changes into the data format of the storage 1 interior from the data format for fiber channels. At the logical volume Management Department 30, the address of logical volume 35-a which should write in block data is deduced from the address sent together with data. Block data is written in the physical address on the drive specified by the address translation table in the logical volume Management Department 30 after that.

[0015] When reading block data, the address of power logical volume 35-a which reads block data from the address of the block data specified from the host computer is deduced. Then, data are read from the physical address on the drive specified by the address translation table in the logical volume Management Department 30, and after changing into the data format for fiber channels from the data format of the storage 1 interior and performing protocol processing of a fiber channel by block data radial transfer section 10-a, it outputs from the fiber channel port 50.

[0016] When writing in file data, file data is inputted from the Ethernet port 52. Next, by file data radial transfer section 10-b, Internet Protocol processing is performed and it changes into the data format for file system 20. In a file system 20, the address of logical volume 35-b which memorizes data is deduced from file data, and file data is changed into block data. Then, it writes in the physical address on the drive specified by the address translation table in the logical volume Management Department 30.

[0017] When reading file data, in a file system 20, the address of logical volume 35-b is deduced from the file data specified from the host computer. Then, block data is read from the physical address on the drive specified by the address translation table in the logical volume Management Department 30, and it changes into file data in a file system 20, and by file data radial transfer section 10-b, it changes into the data format for Internet Protocol from the data format for file system 20, and outputs from the Ethernet port 52.

[0018] According to this example, the disk array equipment 8 and NAS7 which are shown in drawing 2 are made intermingled in one system, and since it becomes possible to share the drive which memorizes block data and file data, a deployment of drive capacity is attained. Moreover, thereby, management of a system is simplified. It becomes possible to cut down TCO of storage by these.

[0019] Moreover, in this example, a logical volume as shown in drawing 4 can also be assigned. That is, a logical volume is divided into logical volume 35-a for block data storage, logical volume 35-b for file data storage, and logical volume 35-c belonging to neither. Allocation of a logical volume is performed like the method explained in drawing 1 by setting up the logical volume composition table in the logical volume Management Department 30 by the service processor. After working storage 1, for example, when the opening of logical volume 35-a for block data is lost, a required number of logical volumes are assigned and changed to logical volume 35-a for block data among logical volume 35-c by rewriting a logical volume composition table from a service processor. It is the same when the opening of logical volume 35-b for file data is lost. Moreover, an intact logical volume or the logical volume which it stopped using can also be assigned and changed to logical volume 35-c among logical volume 35-a or 35-b by rewriting a logical volume composition table from a service processor. According to how to assign drawing 4, even when an opening is lost to both logical volume 35-a for block data, and logical volume 35-b for file data, it becomes possible to newly add a logical volume.

[0020] <<example 2>> Other examples of this invention are shown in drawing 5 and drawing 8. This example describes the case where the unit which manages the storage region of storage is a logical volume. About other cases, the same effect is acquired by applying the view of this example. Drawing 5 shows other logical organization of storage 1. The logical organization of the storage 1 shown in drawing 5 is the same as that of the composition shown in drawing 1 of an example 1 except for block data radial transfer section 10-a of drawing 1 and file data radial

transfer section 10-b being unified, and having Ethernet port 54-a for four block data, and Ethernet port 54-b for four file data as a port with block data and the file data radial transfer section, and a bird clapper. If an Ethernet port is a port which can output and input not only this but an Internet Protocol packet, it is satisfactory.

[0021] One of the main examples of mounting composition of the logical organization of drawing 5 is shown in drawing 8. Storage 1 consists of four RAID modules 43 which have one Ethernet port 54-a, respectively, one file server 40 which has four Ethernet port 54-b, and two or more drives 44. A file server 40 and four RAID modules 43 are connected with four Ethernet 5. Here, it does not pass over the above-mentioned number in the one example, and there is what limits the number above. [ no ] Here, although the total of the port which storage 1 has is fixed to eight from a limit of the physical size of storage, the number of Ethernet port 54-a can be increased by increasing the number of the RAID modules 43. In this case, the number of Ethernet port 54-b with which only the increment of Ethernet port 54-a is connected with a file server is reduced. The number of Ethernet port 54-a can be increased also by increasing the number of Ethernet port 54-b connected with one RAID module 43. On the contrary, when increasing the number of Ethernet port 54-b connected with a file server 40, the number of Ethernet port 54-a with which only the increment is connected with the RAID module 43 is reduced. By carrying out like this, it becomes possible to set up the number of Ethernet port 54-a, and the number of Ethernet port 54-b according to a demand of a user.

[0022] The composition of the RAID module 43 turns into composition which transposed the fiber channel 4 connected with an input/output controller 150 to Ethernet 5 in the RAID module 42 shown in drawing 11. An input/output controller 150 inputs the block data from Ethernet port 54-a, and the block data which changed the file data from Ethernet port 54-b by the file server 40, and was obtained. And the function to process an Internet Protocol packet is newly added to an input/output controller 150. In an input/output controller 150, for example like iSCSI, the Internet Protocol packet which put the packet of the SCSI protocol which exchanges block data on the interior is processed, the packet of the SCSI protocol in Internet Protocol is taken out, or the packet of a SCSI protocol is carried on an Internet Protocol packet. Furthermore, radial transfer of the block data in the packet of a SCSI protocol is performed. Processing of other parts is the same as that of the RAID module 42. The file server 40 is the same as that of the composition shown in drawing 12. How to assign a logical volume is the same as that of an example 1.

[0023] Hereafter, the writing of block data and file data and operation of each part at the time of read-out are shown. When writing in block data, block data is inputted from Ethernet port 54-a for block data. Next, in block data and the file data radial transfer section 11, Internet Protocol processing is performed, the packet of a SCSI protocol is taken out from an Internet Protocol packet, block data is further taken out from the inside of the packet of a SCSI protocol, and it changes into the data format of the storage 1 interior. Subsequent processing is the same as that of an example 1.

[0024] When reading block data, in block data and the file data radial transfer section 11, Internet Protocol processing is performed, the packet of a SCSI protocol is taken out from an Internet Protocol packet, and the address of the block data read further is deduced. The address of power logical volume 35-a which reads block data from the address of the block data is deduced. Then, data are read from the physical address on the drive specified by the address translation table in the logical volume Management Department 30, and in block data and the file data radial transfer section 11, it changes into the data format of a SCSI protocol from the data format of the storage 1 interior, the packet of a SCSI protocol is put on an Internet Protocol packet, and it outputs from Ethernet port 54-a.

[0025] When writing in file data, file data is inputted from Ethernet port 54-b. Next, in block data and the file data radial transfer section 11, Internet Protocol processing is performed and it changes into the data format for file system 20. Subsequent processing is the same as that of an example 1.

[0026] When reading file data, it is the same as that of an example 1 except performing processing performed by file data radial transfer section 10-b in block data and the file data



radial transfer section 11. According to this example, the disk array equipment 6 and NAS7 which are shown in drawing 3 are made intermingled in one system, and since it becomes possible to share the drive which memorizes block data and file data, a deployment of drive capacity is attained. Moreover, thereby, management of a system is simplified. It becomes possible to cut down TCO of storage by these. Moreover, also in this example, a logical volume as shown in drawing 4 can be assigned.

[0027] <<example 3>> Other examples of this invention are shown in drawing 6 and drawing 13. This example describes the case where the unit which manages the storage region of storage is a logical volume. About other cases, the same effect is acquired by applying the view of this example. Drawing 8 shows other logical organization of storage 1. The logical organization of the storage 1 shown in drawing 8 is the same as that of the composition shown in drawing 5 of an example 2 except for having four block data and the Ethernet port 56 of file data common use as a port. If an Ethernet port is a port which can output and input not only this but an Internet Protocol packet, it is satisfactory.

[0028] One of the main examples of mounting composition of the logical organization of drawing 6 is shown in drawing 13. Storage 1 consists of one IP (Internet Protocol) switch 46 which has four block data and the Ethernet port 56 of file data common use, four RAID modules 43, one file server 40, and two or more drives 44. IP switch 46 and four RAID modules 43 are connected with four Ethernet 5. Moreover, a file server 40 and four RAID modules 43 are connected by four fiber channels 4. Moreover, IP switch 46 and a file server 40 are connected with two Ethernet 5. IP switch 46 judges whether the data inputted from the Ethernet port 56 are block data, or it is file data, in the case of block data, outputs it at the RAID module 43, and, in the case of file data, is outputted at a file server 40. In a file server 40, file data is changed into block data and it outputs to the RAID module 43. Here, it does not pass over the above-mentioned number in the one example, and it does not limit the number above. The RAID module 43 is the same as that of the composition of the RAID module 43 stated in the example 2, and a function. The file server 40 is the same as that of the composition shown in drawing 12. How to assign a logical volume is the same as that of an example 1.

[0029] Hereafter, the writing of block data and file data and operation of each part at the time of read-out are shown. In this example, block data and file data are inputted from the common Ethernet port 56. And in block data and the file data radial transfer section, Internet Protocol processing is performed and the packet the packet for block data or for file data is discriminated by the port number shown in the TCP packet in an Internet Protocol packet. Subsequent processing performs operation shown in the example 2 according to either block data or the file data, and same operation. According to this example, the disk array equipment 6 and NAS7 which are shown in drawing 3 are made intermingled in one system, and since it becomes possible to share the drive which memorizes block data and file data, a deployment of drive capacity is attained. Moreover, thereby, management of a system is simplified. It becomes possible to cut down TCO of storage by these. Moreover, also in this example, a logical volume as shown in drawing 4 can be assigned.

[0030] <<example 4>> The method of high-speed backup of the file data in this invention is shown in drawing 9. This example describes the case where the unit which manages the storage region of storage is a logical volume. About other cases, the same effect is acquired by applying the view of this example. Drawing 9 shows the example which backs up the file data of the storage 1 of drawing 1 stated in the example 1 to a tape unit 60 by the SAN2 course of FC (fiber channel) base. A tape unit 60 has the interface of the fiber channel 4, and performs writing/read-out of block data. The host server 1 has the interface of both the fiber channel 4 and Ethernet 5. The host server 1 is LAN3 and Ethernet port 52 course, specifies the directory of the file data which backs up and publishes a backup demand to storage 1. The file system 20 which received the demand deduces the logical volume for backup from the file directory for backup, and notifies the logical volume Management Department 30 of object volume, and a demand is published [backing up as block data, and J. The logical volume Management Department 30 which received the demand reads data from the physical address on the drive of the demand logical volume specified by the address translation table. After changing the read

data into the data format for fiber channels from the data format of the storage 1 interior by block data radial transfer section 10-a and performing protocol processing of a fiber channel, from the fiber channel port 50, by the SAN2 course of FC base, it transmits to a tape unit 60 and records on it.

[0031] The feature of this example is backing up file data by the data path 101 shown in drawing 9, without minding a file system 20. Generally, since a tape unit performed only writing/read-out of block data, when file data was backed up, it needed to back up data to the tape unit as block data through the server which has a file system. When drawing 9 explains, it is the way the host server 1 reads the file data for backup from storage 1 by LAN3 course, and writes in a tape unit 60 via SAN of FC base as block data.

[0032] Since it becomes possible to back up data to a direct tape unit according to this example, without minding a server, high-speed backup of file data is attained. Moreover, since it becomes possible to back up file data to a tape unit, without minding a file system according to this example when it becomes possible for a tape unit to have a file system and to back up file data, a part for the processing overhead in a file system will be cut down in the future, and it becomes accelerable [backup of file data]. Also in the storage 1 of the composition of an example 2 and an example 3, when carrying out this example, it is satisfactory, and the same effect as this example is acquired.

[0033] <<example 5>> The method of the high-speed remote copy of the file data in this invention is shown in drawing 10. This example describes the case where the unit which manages the storage region of storage is a logical volume. About other cases, the same effect is acquired by applying the view of this example. Drawing 10 shows the method of the remote copy of the file data in the storage 1 of drawing 5 stated in the example 2. A remote copy is technology which copies to the disk array equipment of a site which left geographically the data of the disk array equipment of a certain site, and doubles data. With remote copy technology, when the disk array equipment of one site is downed by the disaster caused by man, the natural disaster, etc., in order to continue the business which is using the data of the disk array equipment, it becomes possible to use the data of the disk array equipment of another [which data have doubled] site, and the availability of a system improves.

[0034] Storage 1-1 and 1-2 are the storage of drawing 5 stated in the example 2. Storage 1-1 and 1-2 are in the data center in the geographically distant place, and each is connected to SAN 9-1 of each Ethernet base, and 9-2. Moreover, SAN 9-1 of the Ethernet base and 9-2 are mutually connected through the Internet 8. This example is using the conventional remote copy technology as the base, the control system of the remote copy between storage 1-1 and 1-2 is fundamentally the same in the conventional remote copy technology, and this example describes only the path 106 of the data within the required new processing 105 and the storage at the time of a remote copy here

[0035] The case where the remote copy of the file data is carried out from storage 1-1 to 1-2 is described. The host server 1-1 specifies the directory of the file data made into the object of a remote copy, and publishes a remote copy demand to storage 1-1 through Ethernet port 54-b for file data. The file system 20-1 of the storage 1-1 which received the demand deduces the logical volume for a remote copy from the file directory for a remote copy, and notifies beforehand carrying out the remote copy of the object logical volume by IP (Internet Protocol) communication through Ethernet port 54-b, without minding a file system from Ethernet port 54-a for block data to the file system 20-2 of storage 1-2 (arrow 105 in drawing). As for the file system which received the notice, file data returns the consent to the notice from a file system 20-1 to a file system 20-1, as for 20-2, while notifying the logical volume Management Department 30-2 of being inputted from Ethernet port 54-a for block data, without minding a file system, and the target logical volume. The file system 20-1 which received it notifies the logical volume Management Department 30-1 of the volume for a remote copy.

[0036] The case where the demand whose above-mentioned remote copy demand copies all the file data of the volume for a copy to below from storage 1-1:1-2, and the demand which updates the file data updated by storage 1-2 when the file data in the volume for a copy of storage 1-1 is updated after a copy are included is explained. The logical volume Management Department

30-1 reads the notified volume for a remote copy from a drive, it is block data and the file data radial transfer section 11-1, changes into the data format of a SCSI protocol from the data format of the storage 1 interior, puts the packet of a SCSI protocol on an Internet Protocol packet, and transmits to storage 1-2 by the SAN9 course of the Ethernet base from Ethernet port 54-a. The logical volume Management Department 30-2 which received the data of a remote copy discriminates that it is the remote copy of file data from the address of the object logical volume sent with data, and copies object volume. (Arrow 108 in drawing). Moreover, when the data in the volume set as the copy object in storage 1-1 are updated, the updated applicable data are read from a drive, in block data and the file data radial transfer section 11-1, it changes into the data format of a SCSI protocol from the data format of the storage 1 interior, the packet of a SCSI protocol is put on an Internet Protocol packet, and it transmits to storage 1-2 by the SAN9 course of the Ethernet base from Ethernet port 54-a. The logical volume Management Department 30-2 which received the data of a remote copy discriminates that it is the remote copy of file data from the address of the object logical volume sent with data, and updates the applicable data in object volume (arrow 106 in drawing).

[0037] Since it becomes possible to perform the remote copy of the file data between storage, without minding a file system according to this example, a part for the processing overhead in a file system is cut down, and it becomes possible to accelerate the remote copy of file data. Also in the storage 1 of the composition of an example 1 and an example 3, when carrying out this example, it is satisfactory, and the same effect as this example is acquired.

[0038]

[Effect of the Invention] According to this invention, in the mixture environment of the block formal data storage equipment represented by disk array equipment and the file-format data storage equipment represented by NAS, a deployment of drive capacity is possible and the storage with which management was simplified can be offered. Moreover, it becomes possible to offer the storage which can accelerate backup and the copy of file-format data.

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[Translation done.]

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DESCRIPTION OF DRAWINGS

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## [Brief Description of the Drawings]

[Drawing 1] It is drawing showing the logical organization of the storage by this invention.

[Drawing 2] It is drawing showing the mixture environment of disk array equipment and NAS.

[Drawing 3] It is drawing showing other mixture environment of disk array equipment and NAS.

[Drawing 4] It is drawing showing other logical organization of the storage by this invention.

[Drawing 5] It is drawing showing other logical organization of the storage by this invention.

[Drawing 6] It is drawing showing other logical organization of the storage by this invention.

[Drawing 7] It is drawing showing the mounting composition of the storage shown in drawing 1.

[Drawing 8] It is drawing showing the mounting composition of the storage shown in drawing 5.

[Drawing 9] It is drawing showing the backup method of the file-format data from the storage of this invention to a tape unit.

[Drawing 10] It is drawing showing how to perform the remote copy of file-format data between the storage of this invention.

[Drawing 11] It is drawing showing the composition of the RAID module shown in drawing 7.

[Drawing 12] It is drawing showing the composition of a file server shown in drawing 7.

[Drawing 13] It is drawing showing the mounting composition of the storage shown in drawing 6.

## [Description of Notations]

1 Storage

2, 9-1, 9-2 SAN

3 LAN

8 Internet

10-a Block data radial transfer section

10-b File data radial transfer section

11 12 Block data and the file data radial transfer section

20 File System

30 Logical Volume Management Department

35-a, 35-b, 35-c Logical volume

40 File Server

42 43 RAID module

44 Drive

46 IP Switch

60 Tape Unit

150, 151, 152 Input/output controller

165 166 Data buffer

170 Logical Volume Controller

180 Processor

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[Translation done.]